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MISCELLANY, BOOKS AND ART.

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Edison Thinks Time Is Near for Books To Be Printed on Metal Leaves

Famous Inventor Says He Is Now Making Metal Sheets Thinner, Tougher and Cheaper Than Book Paper.

By Eric Adolphus Dime.

AT the present rate of depletion of our forests the time is not far away when the pulp supply for the manufacture of paper will have reached its end. Leading lumber men say that the visible supply of standing timber in the United States and Canada will last only from thirty to fifty years more, and unless reforestation is carried out on a large scale publishers will then have to look to some other material to serve as a substitute for paper for books and periodicals.

But take heart; the danger is not so imminent as it appears. If a prophecy made by Thomas A. Edison to me the other day comes true the books of the future will not be printed on paper. The "wizard" of Lewellyn Park confidently expects that the books of the coming ages will be printed on pages of nickel or steel.

A prophecy by Mr. Edison is not a wild dream. The famous inventor generally knows what he is talking about before he makes a prediction. The assertions made by him are preceded by experiments which he quietly conducts in his laboratory. He works secretly for weeks, months and sometimes years, on problems before he takes the public into his confidence, and when he has made a discovery he derives real pleasure from letting the world know about it. I come to this conclusion the other day, as I sat in his laboratory studio discussing with him the European trip from which he had just returned and his plans for the future.

Among the questions I asked him was this:

"Can we ever expect a good substitute for paper in the printing of books and periodicals?"

"Why, yes; steel, copper or nickel will do."

And Mr. Edison said this in as commonplace a way as one man would tell another that a trip from Manhattan to New Jersey could be made through the Hudson tunnels as well as in a ferryboat.

FROM THE GLOBE'S INTERIOR.

Steel, copper or nickel can take the place of paper then. And that means that the material for the books that will line the shelves of libraries of future generations will be taken out of the bowels of the earth instead of from the forests which adorn its surface.

Continuing to discuss this subject, the inventor of the phonograph said: "By an electro-chemical process I can make sheets of steel, copper or nickel that will absorb printers' ink. Of the three metals I consider nickel to be the best substitute for paper. It is possible to produce a sheet of this metal one twenty-thousandth of an inch in thickness and make it cheaper, tougher and more flexible than ordinary book paper."

As he said this Mr. Edison strolled over to one of the shelves and returned with a book with a thickness of about two inches. He held the volume out to me, saying: "If the leaves of this book were made of nickel, it would contain 40,000, and it would only weigh about a pound."

I marvelled at his assertion, because it dawned upon me what this would mean to the publishing business of the world, which now can, by using fine India paper, crowd barely 1,300 pages into the thickness of an inch, while ordinary book paper runs 350 pages to the inch. For some time Mr. Edison has been making these thin nickel sheets for another purpose, and meanwhile he has experimented with their use for printing purposes.

"The nickel sheets," he continued, "will absorb ink the same as paper. The ink would possibly have to be of somewhat different ingredients than that in use at the present, although the latter makes a perfectly good impression on nickel, but that would be only a minor problem which the ink manufacturers could easily solve. The nickel sheets can absorb any color, and it would bring out the same shades as halftones do on fine calendered paper. So whatever is printed on paper, be it type, illustrations or color work, can be printed on nickel."

"How long does it take to make this paper substitute and what would be its cost of manufacture?" I asked.

He replied: "It takes one minute and a half to make a sheet of five square feet of this product, and with the limited facilities we have here, we can turn out one-fourth of a ton a day. In order to produce this nickel on a large commercial scale it would be necessary to build machines that would manufacture the nickel in rolls, like large paper rolls made in the mills, instead of sheets of limited size.

"The cost of manufacture on a small scale is $1.75 a pound, but I believe that this could be reduced to $1 a pound were the nickel sheets to be manufactured in rolls in large quantities."

IS DONE BY ELECTROLYSIS.

Then Mr. Edison described the process of making nickel sheets and how they are made so thin. The operation is performed by electrolysis, and the process is accurate to a high degree. The electrical current deposits on a prepared base one twenty-thousandth of an inch of nickel in a minute and a half. No more, no less, because there is an absolute law that governs this.

Books of nickel leaves could have covers of the same material or of steel if necessary. Beautiful designs could be pressed into the covers, which could also be colored, so as to represent cloth or leather binding.

It seems certain that if the experiments carried on by the Orange inventor lead to the manufacture of metal substitutes for paper on a large scale it will be a comfort to librarians who for years have complained of the poor paper product of today. They say that the paper on which volumes are at present printed is so poor that it will crumble to dust within a hundred years. Think of the fortunes spent in the printing of the millions of volumes contained in the many thousands of libraries in this country alone and of the certainty that if all these records are to be preserved indefinitely the books will have to be republished with the passing of every century. Think also of the number of valuable books which have been destroyed by fire! Nickel leaves would be impervious to moderate heat. They would melt, of course, under extreme heat, but they are not combustible themselves. And a nickel book could be soaked with water for an indefinite period and after a brief drying process be just as good as new.

Metal books would have other advantages. Imagine a single volume, containing forty thousand pages. It would be about one inch thick, but would be equivalent in printing space to two hundred paper-leaved books of two hundred pages each. These would make a pile nine feet, six inches high. Between two steel covers one might find a complete library of history or science or fiction or poetry. Two hundred books in the present bulk of one book. Dr. Eliot's famous five-foot shelf would not be overcrowded by 2,400,000 printed pages of nickel.

The introduction of books of nickel and steel would mean the saving of vast sums in the erection of the library buildings of the future. The world's literature is constantly on the increase, and buildings are necessary to house the volumes. The building that contains the Congressional Library at Washington was erected at a cost of $6,347,000, exclusive of the land. This collection of books, which is the largest in the Western Hemisphere, at the end of the fiscal year in 1910 included about 1,793,685 printed books and pamphlets. The book stacks contain about fifty-six miles of shelving, affording space for 2,600,000 octavo volumes. But it will not be many years before all the vacant book spaces will be filled, and then will come a demand for another building. Were nickel books to be added to this collection, the present building would possibly be able to take care of the coming volumes for many years. There would be space for something like 1,000,000 books of 40,000 pages each.

The possibility of inserting twenty thousand nickel leaves in a book with the thickness of only an inch would give persons who had extensive libraries and who live in small and crowded apartments in cities like New York more room to spare. The future offers no hope for more room for city residents. Available space is becoming rarer every day, but the libraries of the future New Yorkers will not occupy more space than a hat box.

Mr. Edison spoke of the convenience that we would find in the small size of nickel books. He said:

"A Bible of this metal could be made the size of a matchbox and carried easily in the vest pocket. Webster's standard or complete dictionary, which has a thickness of about six inches, could be condensed into a book smaller than a brick, and be carried, with plenty of room to spare, in the coat pocket. If the volume had nickel leaves. A lawyer could slip the law records of a hundred years under his arm and carry them to and from court without inconvenience."

Wishing to know if nickel sheets would be as desirable for newspapers as for book pages, I asked Mr. Edison for the information. To this he replied:

"On account of the extreme thinness of the nickel sheets, I hardly believe that they would serve well as a substitute for the paper on which our newspapers are printed. The large size of newspapers, compared with the pages of a book, and the exceedingly rough handling to which the former are subject, would crumple the metal sheets too much. It is chiefly for books, and especially for reference works and books of art, that nickel would serve as a substitute for paper. But let me tell you one thing which I consider should be of the most vital importance to the newspapers at the present time:

"The newspapers of the United States ought to get together and form an association, the object of which should be to experiment with inks that could serve as a substitute for carbon ink. The latter should be abandoned, because it is responsible for the greatest waste in by-products in this country to-day. A newspaper that has once been read ought to go into a pulp-mill and be made over into new paper on which our dailies and other periodicals are printed. But this cannot be done as long as carbon ink is used in printing, since the ink will not come out in the bleaching process. What is wanted is an ink from a black organic substance which the bleaching will remove.

"It is a shame to think of the waste that results from abandoned newspapers. Of course, a great number of these are gathered and made over into wrapping paper, but they should be used for newspapers over and over again. We are compelled to cut from two hundred to three hundred acres of trees every day to supply the printing presses with paper. Think of the waste! I don't see why the publishers of New York have not given this matter serious thought, because it would be money in their pockets to make a move for a different quality of ink. The metropolitan newspapers would support a pulp mill erected for the purpose of turning the old newspapers into a new and like product.

"Under the laws of this country I am not at all surprised at the rapid depletion of our extensive forests. Unless these are properly conserved, the time cannot be far away when the glories of the woodland will be things of the past. In Germany there is a law that says that no man can cut down a tree without planting another. This law preserves the forests of Germany, and certainly it is a wise law. It should be the same in this country. If such a law had been enforced here some decades ago we would not have the present vast denuded forest areas in the United States."

Another thing which Edison believes will be introduced before long for the benefit of mankind is concrete furniture. It appears to many as if wooden furniture had passed the zenith of its glory. Steel has already been introduced to take the place of wood, and to-day steel cabinets, desks and chairs are made in large quantities. Concrete is now commonly used for houses, factories and other structures, but who would expect this material to be used in bedsteads, tables, cabinets and other household furniture? Mr. Edison says it can, and it won't be long before he will have something ready that will be a surprise to many people.

During our conversation my glances strayed about his spacious library, and what especially arrested my attention was a beautiful cabinet standing in a corner. It is the kind used for containing a phonograph and its records. It was finished in white and gold and had the appearance of wood artistically painted.

"Let me show you something," said Mr. Edison. And with that he took me over to the cabinet. "Here is a piece of furniture made of reinforced concrete," he went on, "and it goes to show what can be made with cement."

Now, I had opportunity to make a thorough inspection of it. It looked for all the world like a wooden article in workmanship and finish. It stood about four feet high and the walls had a thickness of about three-quarters of an inch. Mr. Edison opened the little door swinging on small hinges, and as he struck it with his knuckles there came from it the same resonant sound that is heard when a rap is given to a dry pine board. Above the door was a sort of lattice work, the concrete strips being no larger than a lead pencil, and they were firm and smooth. The cabinet rested on neatly formed legs and contained several shelves. The entire article is made of reinforced concrete with the exception of the hinges, on which swing the door and cover. The inventor pointed out the hard, smooth surface resembling planed, varnished oak. Sharp corners did not show any brittleness either, so there would be few chances that the concrete would chip or break off in case the cabinet received a hard jolt from another object.

This article showed the possibility of concrete for household furniture. I asked Mr. Edison:

"Could you make a bedstead also of this material that would look neat and at the same time be serviceable?"

The man who has already given the world a multitude of priceless inventions grew as enthusiastic as a boy who has received permission to see a circus, and with joy beaming from his countenance he replied:

SAYS HE'LL SURPRISE FOLKS.

"I certainly can, and I can make anything in the line of furniture from reinforced concrete. Let the people wait a little longer and then I will show them something that will strike them with surprise. I am now engaged on experiments in this line and these will demonstrate the latest and one of the most useful applications of cement. I can make a bureau of concrete that will look exactly like Chippendale furniture, and I can produce a chamber suite which will be fit for a king, but which will be cheaper than the cheapest of its kind sold to-day. And it will last for several generations. I am now rigging up a factory for the manufacture of these articles, and when operations are in full swing I will be able, among other things, to make a bedstead which the laboring man can buy for $5, which made of other like-appearing material, might cost him $500. The furniture can be made in mahogany finish or any other finish. Artistic designs can be worked into the concrete so that the man who toils for comparatively meagre wages will be able to have his little home as beautifully furnished as a man much more wealthy.

"Reinforced concrete is the best material for any kind of building construction, and it is not only cheaper than brick and steel, but it is fireproof. It outlasts any stone that is known to the building world. There stands in Italy a triumphal arch of concrete that is eighteen hundred years old, and it is to-day in just as good state as at the time it was erected. The people in France learned long ago to create fixed wealth. In this respect they are ahead of the Americans, who, up to this time, have created perishable wealth. The people in France are living to-day in concrete houses that are from two hundred to three hundred years old. The perishable wealth of that foreign country is only one-half of 1 per cent, but the perishable wealth created in the United States is 3 per cent. In other words, where ten men in France spend their time making something that has a short life, sixty men in our country will waste their time for the same purpose.

"Americans have a lesson to learn in this respect, and the sooner they wake up the sooner there will be an improvement in our economic conditions. Within two or three decades I expect to see our finest mansions and our tallest skyscrapers built of reinforced concrete. They will be structures that fires and earthquakes cannot destroy, and their lifetime will be several hundred years."

PROSPECTS FOR THE FUTURE.

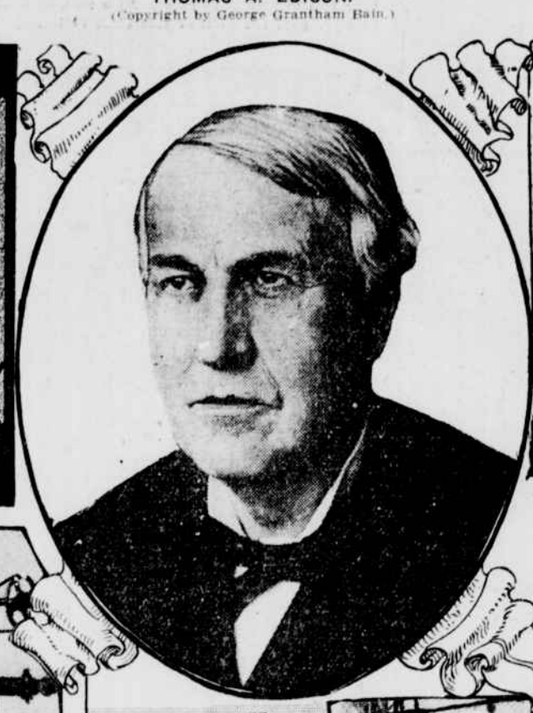
If Mr. Edison's predictions come true our children will be living in houses built entirely of concrete, including doors, window frames and other interior finish. They will be sitting on concrete chairs and will be dining at concrete tables. At night they will be resting on concrete beds and will make their toilets before concrete dressers. Their baths will be taken in cement tubs and the rooms will be heated by concrete furnaces. Portraits and paintings will be hanging in concrete frames. In concrete cases will stand books of metal whose pages will not grow yellow with age nor crumble to dust as the generations come and go. Such homes will need little or no insurance, because they will be practically fireproof throughout. The only combustible material in them will be clothing, carpets and other incidentals.

Although this country has made great headway in the line of inventions during the last half century, Mr. Edison believes that we could have produced more wonders if American inventors had received better protection than they have. He was very emphatic when he criticised the treatment given an inventive genius by our business men and our courts. This is what he told me:

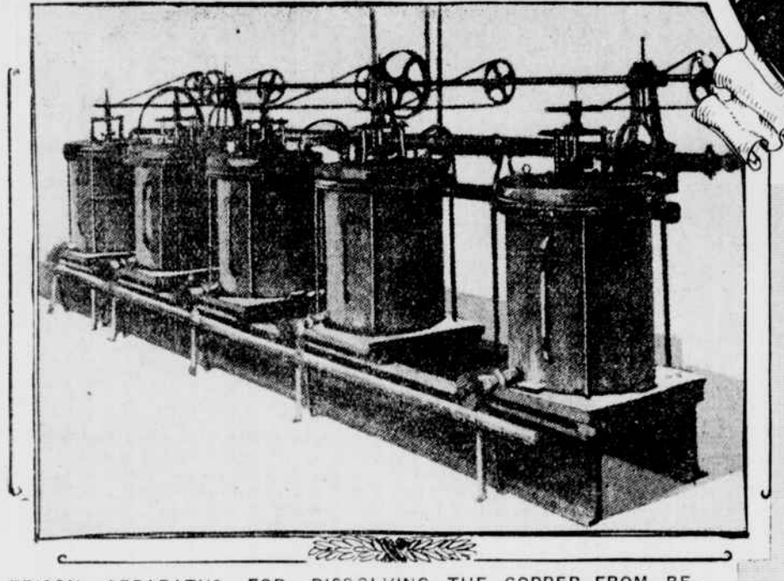
"There is no country in the world that has so many brilliant inventors as the United States. But the creations from the brains of these men are of little or no use to the people as long as our government does not properly sustain patents. A poor man who has invented an article of unusual merit is oftentimes cheated and robbed of his idea. There is to-day little incentive for a poor man to perfect anything worth while. He may have no means of placing it on the market, and the men who promise to help him gain gold and glory and have too often only their own interests at heart, and many of them will resort to any scheme or trick to do the inventor out of his rights. Inventors are not protected by courts as they should be. When lawsuits and litigations arise, the inventors are called to testify, and the man who is not accustomed to be on the witness stand and parry with a shrewd or perhaps crooked lawyer will oftentimes make a damaging statement which may cause him to lose his case. The inventor is the man who creates wealth, but the profit is divided too frequently between the 'business' men and the courts."

PROBABLE SOURCE OF BOOK STOCK IN THE FUTURE.

THOMAS A. EDISON.
(Copyright by George Grantham Bain.)

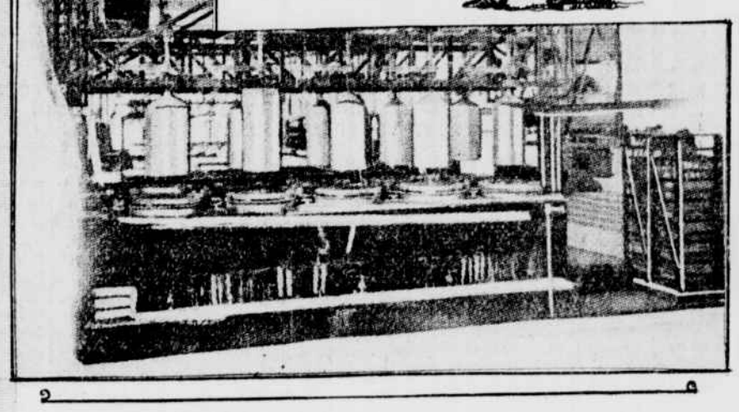


THE PRESENT SOURCE OF BOOK STOCK.



EDISON APPARATUS FOR DISSOLVING THE COPPER FROM BETWEEN LAYERS OF ELECTRO-DEPOSITED NICKEL.

A STRIKING COMPARISON.
In one hand a book of 40,000 nickel pages. The book is about one inch thick. In the other hand 40,000 paper pages, making a pile of books 9 feet 6 inches high.



THE EDISON APPARATUS FOR PLATING NICKEL AND COPPER ALTERNATELY ON A CYLINDER.
The copper is subsequently dissolved, leaving the nickel in flakes of extreme thinness.

Machine Is Expected to Flout One-sixth of the Majestic Law of Gravitation

E. S. Farrow, the Inventor, Tells of Remarkable Economies That Will Follow His Letters Patent.

He Expects, in the Course of Time, to Overcome Entirely, by His Discovery, This Potent Attraction.

AFTER nursing an idea for forty years, Edward S. Farrow, a consulting civil and military engineer of this city, has recently met success, he says, in reducing the power of gravitation. The law of gravitation has held for a long time a unique position among the laws of nature, not only in its wide generality, taking the whole universe in its scope, but in the fact that, so far as known, it was absolutely unmodified by any condition or cause whatever.

Already Mr. Farrow has overcome, according to his own statement, one-sixth of this law. He expects to overcome the whole of it. He says it may take a long time, and again it may be overtaken to-morrow; but that we are now pointed in the right direction there can, he says, be no doubt whatever. Scientists say if Mr. Farrow has discovered the secret of overcoming one-sixth of the force of gravity they feel, with him, that the remaining five-sixths will soon be nullified. If he has discovered how to nullify one six-thousandth of it he will be forever famous, they declare. They say the law of gravity, having been regarded for so long as the broadest and most fundamental one which nature makes known to us, naturally makes them reticent about accepting hurriedly any proposition tending to prove the abrogation of even a millionth part of its workings.

All bodies, when raised in the air and left unsupported, fall to the earth. The force which causes them to do so is gravity. Mr. Farrow says he is now able to prove that by attaching to the body to be raised a mechanical device in the shape of a rectangular box, which he calls a "condensing dynamo," and by applying electrical power, he can eliminate one-sixth of gravity's pull; in other words, diminish the weight of the raised object 16 2-3 per cent.

The other day the inventor suspended a book from a pair of scales in his laboratory, in the presence of the writer, and weighed it. The volume tipped the scales at eighteen ounces. To the book he attached the "condensing dynamo," applied power from a neighboring electric switch, the current set the wheels of the dynamo whirring, and the indicator of the scales slowly but surely receded until it stood at fifteen ounces. Apparently the book had lost three ounces of its weight.

That some such method as this to overcome gravity was understood by Elijah Mr. Farrow thinks highly probable. That it is only a question of a short time until mankind, by the utilization of the "condensing dynamo," may fly at will without wings of the Wright warping or Curtiss aileron type he feels entirely confident. Wings will not be necessary, or even expedient. They will take up too much space, will not be of the least advantage in assisting the operation of the dynamo, merely retarding it, rather, and will not be required to lessen the speed of volplaning to earth, because the descent can be regulated by touching a button on the dynamo that will be strapped on some easily accessible portion of the man's body.

Mr. Farrow believes that the Wright brothers, who are now practising at Kitty Hawk, N. C., with a motorless aeroplane, have acquired a partial insight of the theory in connection with which he has himself made investigations for forty years, but whether they have a sufficient amount of data on which to glide to complete success he is not in a position to say. His opinion is that they have not.

"I believe," said Mr. Farrow the other day, "that with the proper improved mechanical devices, where intense reactions can be overcome, it will be possible largely to reduce the weight of the Lusitania and correspondingly increase speed by diminishing the friction. Right now we can do this. We can, right now, diminish the weights of railroad trains and locomotives by one-sixth, and thus diminish friction, permitting a safer and more rapid travel.

"The airship, as a scout, when approaching too near the enemy, at times concealed, by using the intensified waves which the condensing dynamo would produce, would cause the airship to rise rapidly by using very moderate propulsive force. If the airship was not very heavy, even a light force would push it up rapidly."

Asked for particulars pertaining to his invention, Mr. Farrow said he could only hint at much of the data involved, owing to the fact that matters were now in the hands of the Patent Office, at Washington.

"However, I have no objection to telling you as much as I can," said the inventor, "and might as well begin with the year 1887, when Hertz discovered the Hertzian waves and gave the signal for serious investigation in this new field of wave motion.

"I discovered that although the Hertzian waves travel with great rapidity—greater than first thought—in horizontal and parallel planes, there was, nevertheless, a vertical component of disturbance created by these waves. You can have an ocular demonstration of what I mean by placing a pole in the water where there are travelling waves. You will observe that the pole is wet, say, for several inches above the plane where for the moment you see the uppermost particle of water of the wave. Therefore, at some time, in some way, some force must have lifted upward some particles of water to wet the pole.

"This is the force we are after. Now, if in any way the Hertzian waves can be intensified as they go forward we can in the same proportion intensify the vertical component of the said force, and this component, acting vertically upward, counteracting the vertical pole downward, due to the force of gravitation, will consequently diminish the weight of the raised object proportionately.

"To-day we are able to diminish such weights about one-sixth. But with the improved mechanical devices and new methods of application it is believed that the force of gravitation may be very largely suspended, if not entirely."

Surprise being expressed, Mr. Farrow continued pleasantly to explain by saying: "You can, for instance, cut off or suspend the electric current, in whole or in part. A few years ago this could not be done. I assert that the force of gravitation, whatever it is, is an element of the one great universal force, just the same as electricity, magnetism and other evidences of force are elements of the great universal force. We see these mysterious elements of the one great universal force all around us, and as yet we know nothing concerning them. True, Kepler gave us his laws concerning gravitation, and there we have rested. We have made a little progress in electricity and are now on the verge of the wireless field, in which, on Hertzian waves, we can approach and really investigate the great universal force. No one can tell why the earth turns from west to east, rather than in some other direction. Yet we see it every day. No one can tell why the lifting magnet does its work. No one can tell why the magnetic needle is pulled to the north, yet these facts are in daily evidence. It will be learned after investigation that all these forces similarly controlled will be found actuated and regulated by wave motion or vibration."

Hertz demonstrated that a very rapid oscillating discharge of electricity, such as that which may be established between two knobs, produces a disturbance in the surrounding ether which takes the form of electric waves, penetrating space with the velocity of light. It was found that these waves were nearly a metre in length, that they were reflected from the surface of an electric conductor, and that they could be transmitted without the aid of any known conductor. Previous to this discovery scientists had known of electric currents passing from point to point through the air without a visible conductor, such as the lightning or the sparks between the poles of a battery. But it was not until Hertz advanced his theory that a satisfactory explanation was given of such phenomena.

Mr. Farrow's invention, he says, is based on the intensification of Hertzian waves. He says that various scientific subjects, such as wave motions, aeronautics, wireless telegraphy and the Hertzian waves, have all played a part. His chief interest in the development of his invention lies quite naturally, he says, in its possible application to aerial warfare.

"In the case of the war balloon," he said, "or other aircraft floating over a hostile camp and becalmed at an altitude within range of new aerial guns, the latter would make its destruction and the death of its occupants a practical certainty. Owing to lack of wind, insufficient ballast, depleted gas supply or broken engine it could not be moved from its dangerous position.

"But with my condensing dynamo attached, when its possibilities are realized, the balloon or aeroplane would be shot up beyond the range of the aerial guns and the spies would float away on an upper current to safety. In other words," said Mr. Farrow, "my mechanical device increases the force of Hertzian waves, that travel at the rate of 180,000 miles a second, and this increased power is transmitted to the vertical component. This latter thus intensified offers a proportionate resistance to gravitation, and the force of the latter is reduced, thus giving buoyancy to any object to which the condensing dynamo may be attached. Why, an aeroplane, equipped with one of these condensing dynamos of sufficient strength," he continued, "may be sustained in the air, or even shot up to greater heights, after its motive power has ceased to work."

In fact, applications of the gravity dispeller are countless in number, he said. In the arsenal, armory and foundry heavy guns and military equipment can be lifted and transported with much less power and lighter devices. It doesn't make any difference how heavy the object. When Mr. Farrow has nullified the whole law of gravity it will be possible, he said, to take the largest building in New York, for instance, and easily transport it by the aid of the condensing dynamo and such propellers or other contrivances as may best give the structure horizontal acceleration.

"If the building is so constructed that it will rigidly cohere," said the inventor, "and become and remain one rigid body, then, upon cutting said building loose from its foundations there is no reason why the Hudson Terminal, for instance, cannot be raised and moved bodily to any desired place—San Francisco, China—anywhere. If you keep your current in the condenser dynamo the same the building will remain throughout the journey at any given distance from the earth. And, by diminishing or increasing the current from my condenser dynamo you can drop or arise to corresponding parallel horizontal planes of waves highly intensified. Of course, I am speaking now of the time when the law of gravity, instead of being nullified by my invention to the extent of only one-sixth, as is now the case, shall have been proved to be entirely false."

"How long do you think it may be until we may see this thing?" Mr. Farrow was asked.

"We may see it accomplished to-morrow," he replied genially, calmly, taking out his watch to estimate the time left for him to catch a train to his home, at Asbury Park, N. J., "or it may require many minds, in many days of concentration. But now we are surely pointing the way. There isn't any doubt."

Mr. Farrow was graduated from West Point (the United States Military Academy) in 1876. He saw service in the Indian country and was active continuously in the field in Oregon, Idaho and Washington for several years. He compiled "Farrow's Military Encyclopedia," which has long been a standard work.

EDWARD S. FARROW.
Whose invention, it is asserted, will enable man to overcome one-sixth of the power of gravitation.